Appendix B shows changes to the claims from the previous version of the claims previously in this application.

Applicant notes that all non-elected claims have been cancelled by way of the foregoing amendments.

IN THE DRAWINGS

Applicant is filing herewith proposed drawing changes.

IN THE SPECFICATION

On the Cover Sheet to the application, change "Provisional" to --Non-Provisional--. A clean version of the change appears as Annex A. A marked-up version comparing Annex A to the text previously in the case appears as Annex B.

Amend the paragraph beginning at line 24, page 20 and continuing to page 21, line7 to read as Annex C. Annex D shows changes in the text of Annex C relative to previous text in the case.

Amend the paragraphs beginning on page 21, line 27 and continuing to page 22, line 11 to read as Annex E. Annex F shows changes in the text of Annex E relative to previous text in the case.

Amend the paragraph beginning on page 22, line 28 and continuing to page 23, line 11 to read as Annex G. Annex H shows changes in the text of Annex G relative to previous text in the case.

Amend the paragraph beginning on page 25, line 11 to read as Annex I. Annex J shows changes in the text of Annex I relative to previous text in the case.

Amend the paragraph beginning on page 26, line 1 to read as Annex K. Annex L shows changes in the text of Annex K relative to previous text in the case.

Amend the paragraph beginning on page 27, line 21 to read as Annex M. Annex N shows changes in the text of Annex M relative to previous text in the case.

change to line 1

Amend the paragraph beginning on page 29, line ~~2~~ 1 to read as Annex O. Annex P shows changes in the text of Annex O relative to previous text in the case.

Amend the paragraph beginning on page 33, line 7 and continuing to page 35, line 17 to read as Annex Q. Annex R shows changes in the text of Annex Q relative to previous text in the case.

Amend the paragraph beginning on page 37, line 9 and continuing to page 38, line 14 to read as Annex S. Annex T shows changes in the text of Annex S relative to previous text in the case.

Amend the paragraph beginning on page 39, line 4 and continuing to page 41, line 22 to read as Annex U. Annex V shows changes in the text of Annex U relative to previous text in the case.

add line 1

Amend the paragraph beginning on page 43, line 1 and continuing to page 45, line 8 to read as Annex W. Annex X shows changes in the text of Annex W relative to previous text in the case.

Amend the paragraph beginning on page 45, line 22 and continuing to page 46, line 22 to read as Annex Y. Annex Z shows changes in the text of Annex Y relative to previous text in the case.

Amend the paragraph beginning on page 46, line24 and continuing to page 50, line 10 to read as Annex AA. Annex BB shows changes in the text of Annex AA relative to previous text in the case.

Amend the paragraph beginning on page 57, line 9 and continuing to page 58, line 19 to read as Annex CC. Annex DD shows changes in the text of Annex CC relative to previous text in the case.

Amend the paragraph beginning on page 58, line 21 and continuing to page 59, line 21 to read as Annex EE. Annex FF shows changes in the text of Annex EE relative to previous text in the case.

ANNEX A
(clean version of Cover Page of Application)

Express Mail Label No. EJ486761210US

Attorney Docket No. 2160 (FJ-99-36)

United States Non-Provisional Patent Application of:

Erland R. Sandstrom,
Brigitte K. Weigert,
Donald McCarthy,
Michael G. Thomas,
and
Michael A. Freek

For:

INJECTION BLOW-MOLDED DISPOSABLE TUMBLER AND METHOD OF MAKING SAME

ANNEX C
(clean version of pages 20 and 21 of specification)

A15

Tumbler **10** is optionally provided with a molded-in design **28** which is more clearly seen by reference to **Figures 1(b)** and **1(c)**. Base sidewall **26** extends upwardly to define an outer edge **30** which attaches to sidewall **14**. Sidewall **14** extends upwardly to fortified rim **16**. Rim **16** is integrally formed with sidewall **14** and is a continuous generally circular or oval, solid polymer bead extending about periphery **18** of opening **20**. Rim **16** has a width indicated at **31** which is defined by the difference between an inner diameter **32** and an outer diameter **34** of rim **16** and a height **35** which is the distance over which the width indicated at **31** extends. The width at **31** is thicker than adjacent sidewall portion **38** which is typically of the same caliper as the rest of sidewall **14**. In the example shown in **Figures 1(a) – 1(c)**, adjacent sidewall portion **38** has a thickness of 10 mils, height **35** is approximately 28 mils and the width at **31** is approximately 40 mils at its thickest point.

<u>Annex E</u>
(clean version of pages 21 and 22 of specification)

A16

There is shown in **Figures 2(a) and 2(b)** another tumbler **210** constructed in accordance with the present invention. In general, tumbler **210** has a base portion **212**, a sidewall portion **214** and an upper circular fortified rim portion **216** which extends about the periphery **218** of an opening **220** of tumbler **210**. Base portion **212** of tumbler **210** is integrally formed with the rest of the tumbler and includes a bottom **222** which has a meniscus portion **224** and a base sidewall **226**. Base sidewall **226** is typically thicker than sidewall **214**, and has slightly reversed taper as opposed to the taper of sidewall **214**.

Tumbler **210** is provided with a molded-in design **228** which is a series of concentric rings as shown on **Figures 2(a)** and **2(b)**. The dimensions of tumbler **210** are otherwise substantially identical to the dimensions of the tumbler **10 of Figures 1(a) – 1(c)**.

Annex G
(clean version of pages 23 and 23 of specification)

Base sidewall **326** extends upwardly to define an outer edge **330** which attaches to sidewall **314**. Sidewall **314** extends upwardly to fortified rim **316**. Rim **316** is integrally formed with sidewall **314** and is a continuous generally circular or oval, solid polymer bead extending about periphery **318** of opening **320**. Rim **316** has a width indicated at **331** which is defined by the difference between an inner diameter **332** and an outer diameter **334** of rim **316** and a height indicated at **335** which is the longitudinal distance over which the width at **331** extends. The width at **331** is thicker than adjacent sidewall portion **338** which is typically of the same caliper as the rest of sidewall **314**. In the example shown, adjacent sidewall portion **338** has a thickness of 20 mils, the height at **335** of the rim is approximately 28 mils and the width at **331** is approximately 40 mils at its thickest point. Other dimensions of tumbler **310** are approximately identical to those of tumblers **210** of **Figures 2(a)** and **2(b)** and tumbler **10** of **Figures 1(a) – 1(c)**. Tumbler **310** thus has a taper of 3°.

A17

Annex I
(clean version of page 25 of specification)

There is shown in **Figures 6(a)** through **6(c)** a tumbler **610** constructed in accordance with the present invention. In general, tumbler **610** has a base portion **612**, a sidewall portion **614** and an upper circular rim portion **616** which extends about the periphery **618** of an opening **620** of tumbler **610**. Base portion **612** of tumbler **610** is integrally formed with the rest of the tumbler and includes a bottom **622** which has a meniscus portion **624** and a base sidewall **626**. Base sidewall **626** is typically thicker than sidewall **614**, and has either no taper, or a reverse taper from the taper of sidewall **614**.

<u>Annex K</u>
(clean version of page 26 of specification)

A19

Base sidewall **626** extends upwardly to define an outer edge **630** which attached to sidewall **614**. Sidewall **614** extends upwardly to fortified rim **616**. Rim **616** is integrally formed with sidewall **614** and is a continuous generally circular or oval, solid polymer bead extending about periphery **618** of opening **620**. Rim **616** has a width indicated at **631** which is defined by the difference between an inner diameter **632** and an outer diameter **634** of rim **616** and a height shown at **635** which is the distance over which the width indicated at **631** extends. The width **631** is thicker than adjacent sidewall portion **638** which is typically of the same caliper as the rest of sidewall **614**, that is, sidewall **614** is substantially uniform in thickness on the entire tumbler. In the example shown, adjacent sidewall portion **638** has a thickness of 20 mils, height **635** is approximately 28 mils and width **631** of rim **616** is approximately 40 mils at its thickest point.

Annex M
(clean version of page 27 of specification)

Rim **716** is integrally formed with sidewall **714** and is a continuous generally circular or oval, solid polymer bead extending about periphery **718** of opening **720**. Rim **716** has a width indicated at **731** which is defined by the difference between an inner diameter **732** and an outer diameter **734** of rim **716** and a height shown at **735** which is the distance over which the width indicated at **731** extends. The width indicated at **731** is thicker than adjacent sidewall portion **738** which is typically of the same caliper as the rest of sidewall **714**. In the example shown, adjacent sidewall portion **738** has a thickness of 20 mils, height **736** is approximately 28 mils and width **731** is approximately 40 mils at its thickest point.

Annex O
(clean version of page 29 of specification)

Base sidewall **826** extends upwardly to define an outer edge **830** which attaches to sidewall **814**. Sidewall **814** extends upwardly to fortified rim **816**. Rim **816** is integrally formed with sidewall **814** and is a continuous generally circular or oval, solid polymer bead extending about periphery **818** of opening **820**. Rim **816** has a width indicated at **831** which is defined by the difference between an inner diameter **832** and an outer diameter **834** of rim **816** and a height shown at **835** which is the distance over which the width indicated at **831** extends. The width at **831** is thicker than adjacent sidewall portion **838** which is typically of the same caliper as the rest of sidewall **814**, that is, sidewall **814** is substantially uniform in thickness on the entire tumbler. In the example shown, adjacent sidewall portion **838** has a thickness of 20 mils, the height at **835** is approximately 28 mils and the width at **831** of rim **816** is approximately 40 mils at its thickest point. The tumbler is also provided with a series of molded-in grooves **841** which extend around the tumbler. These grooves provide a grip for a user as well as providing rigidity to the article.

A2'

Annex Q
(clean version of pages 34-35 of specification)

A27

An example of a polycarbonate container in accordance with the present invention is a "bell fountain" container illustrated in **Figures 17(a) - (c)** and is described in detail below. The reusable polycarbonate containers are preferably prepared by the rapidly and economically efficient side-by-side injection blow-molding process as disclosed in aforementioned U.S. 4,540,543. The process is described below in combination with the drawings of **Figures 9-19**. U.S. 4,540,543 is herein incorporated by reference in its entirety. Referring to **Figures 9-11**, injection station **910** is secured in fixed platen **911**. Blow stations **912** and **913** are also secured to fixed platen **911** and are situated adjacent injection station **910** and in side-by-side relationship with respect thereto, with blow station **912** containing blow mold **916** which may be split if desired being on one side of the injection station and blow station **913** containing blow mold **917** which may be split if desired being on the other side. Blow molds **916** and **917** are in the shape of the hollow articles to be made. Ejection stations **914** and **915** are also secured to fixed platen **911** and are situated adjacent the respective blow stations in side-by-side relationship with respect thereto, with ejection station **914** situated adjacent blow station **913** and ejection station **915** situated adjacent blow station **912**.Core **920** is provided secured to movable platen **921** engageable with injection station **910** as shown in **Figure 9**. The injection station **910** includes mold wall **922**. Thus, when core **920** is engaged with injection station **910** as shown in **Figure 9** the core **920** is spaced from the mold wall **922** to form mold cavity **923** therebetween. Injection means **924** is in communication with mold cavity **923** and is connected to a source of hot flowable plastic, i.e., polycarbonate, (not shown) for forcing said hot formable plastic under pressure into mold cavity **923** to form parison **925**. Core **920** is movable into and out of engagement with injection station **910** by movable platen **921** actuated by the motive means shown schematically in **Figure 9** and to be described in more detail herein below. Naturally, the movement of platen **921** may be accomplished by conventional means, shown only schematically in **Figure 9**, which are capable of providing a clamping force between the two platens to keep them from separating during the injection step and the other steps which will be described below. It should be understood that while movement of platen **921** is described, one may of course move platen **911** or both platens **911** and **921**, if desired. The hot, newly formed parison or container **925**

remains in mold cavity **923** until sufficiently cooled to be removed, if desired using cooling means **926** adjacent mold wall **922**, as for example, by fluid circulation. If desired, such cooling means may also be provided in core **920**. After such cooling of parison **925**, the clamping force is released and platen **21** is moved away from platen **11** carrying with it core **920** and parison **925** adhered thereto. If a neck mold is used as to form a threaded neck portion the neck mold is operable by conventional means and remains closed during the formation of the parison, removal of the parison from the injection station and blowing, which also aids in retention of the parison on the core. In the present embodiment, a neck mold is not employed and both the parison and final article have a cup-shaped configuration as seen in the drawings and clearly shown in **Figure 13** and **Figure 17**. In such configuration, the top or mouth of the container (mold) is about as wide or wider than the diameter of the remainder of the container mold. Thus, parison **925** has a base portion **930**, a fortified rim or lip **931** and outwardly flaring side walls **932** extending from base **930** to lip **931**. Fortified rim **931** may serve as an undercut to aid in retention of the parison on the core. Core **920** is provided with fluid passageway **933** connected to a source of fluid pressure for blowing the final article. If desired, a vacuum may be drawn through passageway **933** to aid in retention of the parison on the core. Core **920** with parison **925** thereon is then moved to blow station **913** as shown in **Figures 10** and **11** in a manner which first separates the parison from the mold wall **922** by moving parison core **920** axially in a straight path away from said mold wall at least until the parison clears the injection station, followed by movement in a substantially arcuate path into axial alignment with blow station **913** and blow mold **917**, followed by moving the parison core axially in a straight path into blow mold **917**. Parison **925** is then expanded on core **920** in blow mold **917** by fluid pressure through passageway **933** to form hollow article **934**. **Figure 9** shows core **920** engaged with the injection station. **Figure 10** shows core **920** with parison **925** thereon removed from the injection station on its arcuate path between injection station **910** and blow station **913** with platen **921** and core **920** at the peak of their arcuate path. **Figure 11** shows core **920** engaged with blow station **913** forming hollow article **935** therein. After the formation of hollow article **934**, core **920** is removed from blow station **913** leaving hollow article **934** remaining therein and returned to the injection station along paths corresponding to the path taken by core **920** from the injection station **910** to the blow mold **917**, that is, the core is moved axially in a straight path away from blow mold **917** followed by movement in a substantially arcuate path into axial alignment with

A22 said injection station, followed by movement axially in a straight path into said injection station for repeat of the cycle.

Cont'd

Annex S
(clean version of pages 37-38 of specification)

A23

In operation, the parison is transferred into blow mold **917** as above described and blown into final shape therein, followed by insertion of mandrel **950** which is shorter than the depth of the blow mold. In order to remove the blown article **934**, pusher plate **952** is advanced forcing the blown object onto mandrel **950** which is then withdrawn. If desired, vacuum may be applied through passage **953** better to assure adherence of article **934** to the mandrel during withdrawal from the blow mold. Clearly, pusher plate **952** and the stripper cap **956** may also be used to shape the portion of article **934** between them. If a rim undercut is embedded in the blow mold, it is overcome to effect release from the blow mold by the action of pusher plate **952** which has a stroke at least sufficient for the length of said undercut, it being understood that a given article may exhibit more than one undercut. In this manner, sticking of the finished article to the blow mold is avoided. Subsequently, mandrel **950** carrying article **934** is aligned with removal devices as described above and, since all relative movement between the mandrel and the blow mold may be precluded due to the close fit of the mandrel and the article at the neck of the article, which may be an interference fit or an undercut, and, if necessary due to the vacuum, the alignment will be consistent from cycle to cycle. Upon alignment with the ejection station, the vacuum if theretofore applied through channel **953** is released and stripper **954** is actuated to urge the article into engagement with the ejecting device by positive mechanical means. The advantage of this arrangement compared to previous practice is in its reliability, preventing interruptions of the operation and thereby improving efficiency. While the foregoing description shows a single injection mold and core set, it will naturally be understood that multiple injection mold and core sets may readily be employed, for example, arranged side-by-side or in several rows. Thus, it can be seen that the process and apparatus of U.S. 4,540,543 obtains significant advantages. The overlapping cycles enable plural operations to be conducted simultaneously. While core **920** is engaging injection station **910** to form a first parison, second core **940** is engaging blow mold **916** to form a final article **934**, second ejection core **951** is ejecting a hollow article at ejection station **915** and ejection core **950** is engaging a hollow article at blow station **913** for removal thereof, with the axial, arcuate and axial movement described hereinabove providing a considerable advantage in reduction in cycle time which of

A3 cont'd

course is a prime consideration in this art. The so-called "dry cycle" is that part of the total operating cycle of the apparatus described in **Figures 9-11** which is not attributable to process related factors but only to the mechanism.

Annex U
(clean version to pages 39-41 of specification)

A24

In accordance with the present invention, however, the axial, arcuate and axial movement substantially reduces the dry cycle time and thus reduces the overall cycle time. Referring to **Figure 16**, the movements of movable platen **921** are shown diagrammatically, which will of necessity include the movement of the cores thereon. Thus, when platen **921** moves from the position in **Figure 9** to the position in **Figure 11** a given point on the platen will follow curve A. The return movement will follow curve **B**. As platen **921** moves away from platen **911** the section on curve A from location **960** to **961** represents movement from the closed position of **Figure 9** to that point at which movement of core **920** with parison **925** thereon may occur laterally without mechanical interference. As soon as location **961** is passed said point starts its lateral movement which is subdivided into three (3) sections, namely between locations **961** and **962** in which acceleration is taking place, then between **962** and **963** in which the velocity of the point is constant, followed by between **963** and **964** in which deceleration is taking place. Finally, locations **964** and **965** show the approach to the blow mold and the position shown in **Figure 16**. Naturally, the actual shapes of the curve segments will depend on the mass being moved, with the segment being steeper the lighter the movement assembly. As indicated above, curve **B** depicts the reverse movement. These movements can be effected by any conventional means, e.g. fluid actuators or by cam action. If by fluid actuators, it is readily possible to initiate their movement and thus also that of platen **921** by a limit switch placed to be tripped by platen **921** as soon as said platen reaches the distance from platen **911** at which the lateral movement of core **920** can take place unimpeded. If by cam action, fixed cams in the shape of curves **A** and **B** of **Figure 16** may be used and platen **911** may be equipped with corresponding cam followers, to the effect that the axial movement of platen **921** will at the same time induce its lateral movement according to the cam path. Other means to produce the same result may be employed so long as the lateral movement of platen **921** is effectively controlled by its axial movement, whereby said lateral movement accommodates acceleration and deceleration of platen **921** according to the mass to be moved therewith. The advantage of this improved arrangement is evident from the gain in cycle time. Thus, in the case referred to hereinabove the dry cycle of the injection clamping apparatus is reduced from approximately 4 seconds to approximately 1.2 seconds,

of which the lateral shifting of platen **921** takes only 0.4 to 0.5 seconds including acceleration and deceleration. This improvement is particularly noticeable in connection with mechanical, e.g. toggle or crank clamping mechanisms which are favored for rapid acting injection clamps over fluid actuated clamps. In the former, the clamping apparatus, which is of the "fixed stroke" type can be used to induce the movement of platen **21** during that portion of its opening and closing stroke respectively which is in excess of the minimum clearance between core **920** and mold **917**. Cores **920** and **940** are equipped with fluid passageways terminating in so-called blow slots **970** as shown in **Figure 14** in order to effect blowing of the preforms in the blow molds, as is known in the art. If permanently open, the blow slot **970** is connected according to conventional design of a source of pressure fluid and a source of vacuum via fluid passageway **978** whereby the change from one to the other is effected by a conventional valve in order for the dual function of the blow slot to be readily accomplished as needed during injection and opening of the injection mold, and then during blowing. The blow slot may be formed of two elements of the core, for example leading element **971** and following element **972**, that are capable of relative movement as shown in **Figure 14** by the arrow, with **Figure 11** showing leading element being relatively moveable, with element **971** having a leading bulb-like portion **973** connected to a movable stem **974** which in turn is connected to a motive means (not shown). It is necessary to control the opening and closing of blow slot **970** mechanically in the following sequence: the blow slot is closed and held in that condition while injection of the plastic into the mold is initiated and almost immediately thereafter is opened; alternatively, it may be kept closed until the filling of the mold is accomplished and opened only thereafter. Vacuum is applied while the blow slot is open and maintained as core **920** or **940** is moved away from injection station 910 (*see* **Figures 9** and **10**). The blow slot remains open and vacuum is maintained while the preform moves from the injection station into the blow station, at which time, by suitable valving, the vacuum is broken and fluid pressure applied inside the preform to expand it into the shape of the finished article. At the end of the blowing cycle, the connection between the blow slot and the source of fluid pressure is interrupted, but vacuum is not admitted inside the finished article. Accordingly, in the case of an operable slot, the flow of fluid or connection to vacuum is controlled by a valve system that operates as follows: open to vacuum; closed to vacuum, open to pressureclosed to pressure, open to atmosphereclosed to pressure, closed to vacuum; blow slot closed **Figure 15** shows one embodiment of actuating the blow slot **970**. As shown, a spring **975** is provided, urging the movable element **971** forming the blow slot to open the

A24 Cont'd

A24 Cont'd

latter. Stem **974** is provided with a fixed annular bar **976**. Spring **975** is affixed to stem **974** between bar **976** and internal ridge **977** on element **972**. When inserted into the injection station, the entering plastic will tend to counteract the force of spring **975** closing the blow slot. When the pressure of the entering plastic is relieved, spring **975** will tend to open the slot again. However, if no vacuum is applied, then atmospheric pressure will tend to close the slot or counteract the spring. Accordingly, the spring force chosen has to be such as to maintain the blow slot open against the atmospheric pressure so that vacuum may be applied.

Annex W
(clean version of pages 43-45 of specification)

In accordance with this invention, namely the manufacture of a bell fountain drinking cup as illustrated in **Figure 17(a)** from polycarbonate, the following process parameters can be used with the blow-molding apparatus and process as described in U.S. 4,540,543 and above. Initially, the polycarbonate in the form of pellets is dried to remove moisture. Drying conditions of 3.5 hours at 250°F have been found useful in providing a polycarbonate which can be injection blow-molded into the permaware containers of this invention. The polycarbonate plastic has to be pressure formed into the parison rapidly, hence the molten plastic temperature is left relatively high at from about 450°F to about 700°F, preferably, from about 500°F to about 650°F; and most preferably, a temperature of about 545°F has been found to yield the desired parison. Injection pressures of 1,000 to 3,000 psi can be used, with an injection pressure of about 2,100 psi being most preferred. The parison has to be removed from the parison mold after the shortest possible dwell therein in order to rapidly proceed to the next molding cycle, yet without tending to adhere to the mold and become deformed thereby. For permaware, which require a thicker parison, the time in the parison mold must yield a stable parison. Dwell times in the parison mold to produce the polycarbonate permaware of this invention range from about 1 to 3 seconds, with 2.5 seconds being most preferred. In general, the temperature of the parison has to reach a level suitable for orientation during the short dwell in the parison mold and the comparatively short time, shortened by the clamp action described herein, during which the parison is transported into the blow mold.The temperature at which the deformation of the parison, i.e., blowing takes place, should be uniformly maintained while the parison is expanding and until it contacts the parison mold. Temperatures ranging from about 250°F to about 500°F, and most preferably at about 285°F can be used. In no case must the parison be damaged, nor deformed in the course of any operation to which it is subjected, except of course blowing. A blowing pressure of from about 100 to about 500 psi, preferably, from about 200 to about 400 psi, and most preferably at about 250 psi, is employed. **Figures 17(a)** through **17(c)** illustrate a bell fountain tumbler **979** injection blow-molded in accordance with the present invention. The tumbler can be prepared using a split blow cavity employing two separate halves which can be configured exactly the same or differently to provide separate design elements to the

tumbler. For example, tumbler **979** can optionally be provided with an embossing design defined by embossed flat surfaces **988** and ridges **1004** which circumscribe the embossed areas **988**. The design is operative as a grip for a user since the smooth sidewall is substantially altered. Such tumblers are typically characterized by a seam **1001** along the longitudinal axis of the tumbler. The tumbler **979** has a base portion **980**, a sidewall portion **981** and an upper circular rim portion **982** which extends about the periphery **983** of an opening **984** of tumbler **979**. Base portion **980** of tumbler **979** is integrally formed with the rest of the tumbler and includes a bottom **985**, a base sidewall **987**, and an inner face **989** attached integrally to sidewall **981**. Tumbler **979** as shown is characterized as a "bell fountain" tumbler in which sidewall **981** extends upwardly to convex portion **990** which extends to concave portion **991** and extends to fortified rim **982**. Rim **982** is integrally formed with sidewall **981** and is a continuous generally circular or oval, solid polymer bead extending about periphery **983** of opening **984**. Rim **982** has the advantages that it is rounded and does not snag on the mold or snag with a cup cover as a top curl does. For another advantage, a bead type top rim can more compactly provide rigidity and strength to a cup than does a top curl, with less width. While polymer bead rim **982** is shown as circular in cross section, other profiles may be suitable for example, conic sections such as ellipsoid shapes or truncated conic sections or profiles such as truncated conic sections including a semi-circle or a half ellipse. Rim **982** has a width **W** which is defined by the difference between an inner diameter **993** and an outer diameter **994** of rim **982** and a height **H** which is the distance over which width **W** extends. Width **W** is thicker than the rest of sidewall **981**. Sidewall **981** is substantially uniform in thickness on the entire tumbler. In a preferred form of the bell fountain tumbler shown, sidewall **981** has at thickness of 80 mils, height **H** is approximately 100 mils and width **W** of rim **982** is approximately 100 mils. Also, base sidewall **987** preferably has a height or thickness of about 100 mils. While the base sidewall **987** can have a height up to 8 times the thickness of sidewall **981**, it has been found that under harsh washing conditions, the base tends to deteriorate if it is about 150 mils or more in the polycarbonate tumbler shown. The overall height of the preferred tumbler **979** is 6.625 inches, inner diameter **993** is 3.25 inches, base diameter is 2.325 inches and shoulder **990** has an inner diameter of 3.5 inches. As noted above, tumblers in accordance with the present invention are produced by injection blow-molding thermoplastic optically transparent polymers.

Annex Y
(clean version to pages 45 and 46 of specification)

Referring to **Figure 17(b)**, it can be seen that the bottom of base **985** has been molded to include a concave, flat portion **986** which includes a rim **1005**, both of which locations can be used to imprint product identifying indicia (not shown). **Figure 17(b)** also shows where a lug **1006** has been molded into the bottom **985** of base **980**. Molded lug **1006** can be used to align the tumbler during any subsequent printing operation. Previous to this invention, the incorporation of such molded indicia or components to the base of a blow-molded article, in particular, an article in which the wall thickness was greater than 50 mil, required a separate noncontinuous step in which the article, such as a tumbler needed to be taken from the blow mold at an elevated temperature, and conveyed by a separate conveyor structure to a stamping operation. For relatively thick walled structures including those having a wall thickness of greater than 50 mils, the molding of the indicia could not take place during blow-molding since the fluid pressure during the blowing step could not press the parison to be molded sufficiently hard against a mold surface to provide acceptable indicia or deep structural configurations to the surface such as the printing lug **1006** shown in **Figure 17(b)**. In a novel aspect of the present invention, the polycarbonate tumbler of the present invention can be blow-molded and the base thereof reconfigured in a continuous manner without the need to remove the tumbler from the blow mold and convey the tumbler away from the apparatus to a separate stamping operation. The base molding method and apparatus which are novel to the present invention can be described by referring to **Figure 18**. Thus, after removal of the core from the blow-molding station, as described above, an alternative ejection core can be inserted into the blow cavity which contains the blow-molded container. This alternative ejection core provides a slight pressure against the inside surface of the container pressing the bottom surface of the container against a preformed mold. More specifically, shown in **Figure 18** is the blow cavity of a blow mold **110** such as a blow station **913** as shown in **Figure 11**. Within the blow cavity is the blow-molded tumbler **1012** which includes a sidewall **1014** and a base **1016** which has a bottom surface **1018** which is to be provided with indicia or other structural configurations such as printing lug **1006** as shown in **Figure 17(b)**.

Annex AA
(clean version of pages 46-50 of specification)

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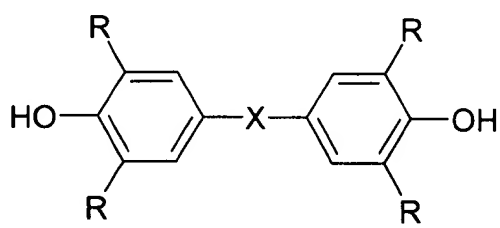
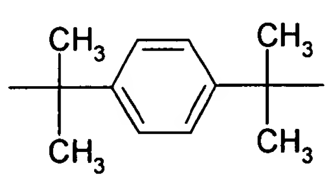
In accordance with the molding operation of the present invention, after the blow-molding step and once the core has been removed from the blow mold **1010** of **Figure 18**, for example, an ejection core **1020** is inserted into the blow cavity and the tumbler **1012** which remains therein. Ejection core **1020** is wide enough to contact the inside edge of sidewall **1014** near or at the base **1016** of tumbler **1012**. Such contact is shown at location **1022**. Bottom edge **1024** of ejection core **1020** contacts the inside surface of base **1016** and pushes the tumbler **1012** against a mold **1026**. Ejection core **1020** can also include a circumferential lip **1021** which engages the lip **1013** of tumbler **1012** so as to aid in pushing tumbler **1012** uniformly against the surface of mold **1026**. In **Figure 18**, mold **1026** is shown containing a mold configuration **1028** which is capable of forming a printing lug on the bottom **1018** of base **1016** such as equivalent to printing lug **1006** shown in **Figure 17(b)**. Mold **1026** can be secured to blow cavity **1010** via threaded connector **1027**. It has been found that the mechanical pressure of ejection core **1020** against the inside surface of base **1016** provides adequate pressure against the mold **1026** to adequately stamp any indicia or other configuration into the base of the tumbler. Typically, the pressure of the ejection core **1020** against the base **1016** within the blow cavity to mold or stamp the base takes approximately 0.5 second. Mold **1026** can include a cooling channel **1030** to provide the cooling of the base subsequent to the molding operation. Likewise, ejection core **1020** can also be provided with a cooling channel **1032**. In each of cooling channels **1030** and **1032**, cooling fluids such as water can be circulated therein to provide the proper temperature. Subsequent to the molding or stamping operation, the ejection core **1020** is removed from the blow cavity. Since the mandrel **1020** contacts the inside sidewall **1014** of tumbler **1012**, the tumbler is removed from the blow cavity as well and transferred to any conveying station as described previously. The ejection core **1020** is an alternative to the ejection core **950** shown in **Figures 11, 12** and **13** and can be attached to a motive means as described above with respect to core **950** to provide a continuous process of injection blow-molding and molding the base of the tumbler. Another improvement in this invention for injection blow-molding permaware polycarbonate tumblers in which a sidewall thickness of greater than **950** mils is provided is shown in **Figure 19**. **Figure 19** is an alternative blow mold cavity configuration which is different than,

for example, the blow cores shown in **Figures 14** and **15**. Thus, in the previous description, blowing of the parison into the molded tumbler was achieved by directing fluid through a blow slot in the core which directed the fluid at the base of the parison mold. Subsequently, the fluid pressure would work its way up the mold and be vented from the entrance of the mold. With respect to the tumbler, the initial fluid pressure would be at the base of the tumbler and work its way along the sidewall to the tumbler opening. In accordance with this invention, it has been found that a uniform blow-molded tumbler can be better achieved by directing the fluid pressure during the blow stage from the top of the mold and working down toward the base of the blow cavity or, with respect to the tumbler, blowing the parison at the opening of the tumbler and working down toward the base of the tumbler. Such configuration is shown in **Figure 19** which includes a blow mold **1040** into which has already been inserted the core **1042** which contains the injected molded parison **1044** contained along the outside surface of core **1042**. The blow mold **1040** includes a mold surface **1046** in the shape of the bell fountain tumbler shown in **Figure 17(a)**. The core **1042** includes a blow vent **1048** which releases a fluid into the mold **1040** near the entrance thereof or with respect to the tumbler, near the opening of the tumbler. The fluid pressure travels down the core **1042** blowing and pressing the parison **1044** against mold surface **1046** from the top of the parison to the base **1050** of the parison. Blow mold **1040** also includes the base mold **1026** as described in **Figure 18** which allows the molding of the base of the blow-molded tumbler once core **1042** is removed and ejection core **1020** is inserted. Mold **1026** includes a vent **1052** connected to the blow cavity to vent excess fluid pressure. It has been found that a more uniform sidewall can be achieved by blowing from the opening of the parison/tumbler to the base thereof. This method of blowing the parison has previously been done to blow polystyrene disposable containers but is not believed to have been done with resins other than polystyrene and not to form permaware tumblers having sidewall thicknesses of greater than 50 mils.The reusable containers of the present invention are formed from aromatic polycarbonates preferably having a weight average molecular weight of from about 10,000 to 200,000, most preferably from about 20,000 to 80,000, and most particularly a melt flow rate range of from about 10 to 22 g/10 min (ASTM D-1238) and which are prepared by methods known to those skilled in the art and more particularly by methods disclosed in U.S. Pat. Nos. 3,028,365, 2,999,846, 3,248,414, 3,153,008, 3,215,668, 3,187,065, 2,964,794, 2,970,131, 2,991,273 and 2,999,835, all incorporated herein by reference.The aromatic polycarbonates useful in practice of the invention are produced by reacting di-(monohydroxyaryl)–alkanes (bisphenols) or

dihydroxybenzenes and substituted dihydroxybenzenes with derivatives of carbonic acid such as carbonic acid diesters, phosgene, bis-chlorocarbonic acid esters of di-(monohydroxyaryl)-alkanes and the bis-chlorocarbonic acid esters of the dihydroxy-benzenes and the substituted dihydroxy-benzenes.By aromatic polycarbonate, in the sense of the present invention, there are understood homopolycarbonate and copolycarbonate resins which are based, for example, on one or more of the following bisphenols: hydroquinone, resorcinol, dihydroxydiphenyls, bis-(hydroxyphenyl)-alkanes, bis-(hydroxyphenyl)-cycloalkanes, bis-(hydroxyphenyl)-sulphides, bis-(hydroxyphenyl)-ethers, bis-(hydroxyphenyl)-ketones, bis-(hydroxyphenyl)-sulphoxides, bis-(hydroxyphenyl)-sulphones and α, α-bis-(hydroxyphenyl)-diisopropylbenzenes, as well as heir nuclear-alkylated and nuclear-halogenated compounds. These and further suitable aromatic dihydroxy compounds are described, for example, in U.S. Pat. Nos. 3,028,365, 2,999,835, 3,148,172, 3,271,368, 2,991,273, 3,271,367, 3,280,078, 3,014,891 and 2,999,846 (all incorporated herein by reference), in German Offenlegungsschriften (German Published Specifications) 1,570,703, 2,063,050, 2,063,052, 2,211,956 and 2,211,957, in French Patent Specification No. 1,561,518 and in the monograph "*H. Schnell*, Chemistry and Physics of Polycarbonates, Interscience Publishers, New York, 1964". Preferred bisphenols are those of the formula I:



in which R is identical or different and denotes H, C_1 -C_4 -alkyl, C1 or Br; preferably H or C_1 -C_4 -alkyl, and in which X is a bond, C_1 -C_8 -alkylene, C_2 -C_8 -alkylidene, C_5 -C_{15} -cycloalkyene, C_5 -C_{15} --cycloalkylidene, -S-, -SO_2 -, -SO-, -CO- or



Annex CC
(clean version of pages 57-58 of specification)

The base molding method and apparatus which are novel to the present invention in one embodiment can be described by referring to **Figure 18**. Thus, after removal of the core from the blow-molding station, as described above, an alternative ejection core can be inserted into the blow cavity which contains the blow-molded container. This alternative ejection core provides a slight pressure against the inside surface of the cup pressing the bottom surface of the cup against a preformed mold. More specifically, shown in **Figure 18** is a blow mold such as at blow station **913** as shown in **Figure 11**. Within the blow cavity is the blow-molded tumbler **1012** in the form of a "bell fountain" tumbler which includes a sidewall **1014** and a base **1016** which has a bottom surface **1018** which is to be provided with indicia or other structural configurations such as a printing. In accordance with the molding operation of the present invention, once the core has been removed from the blow mold **1010** subsequent to the blowing step, an ejection core **1020** is inserted into the blow cavity and the tumbler **1012** which remains therein. Ejection core **1020** is wide enough to contact the inside edge of sidewall **1014** near or at the base **1016** of tumbler **1012**. Such contact is shown at location **1022**. Bottom edge **1024** of ejection core **1020** contacts the inside surface of base **1016** and pushes the tumbler **1012** against a mold **1026**. Ejection core **1020** can also include a circumferential lip **1021** which engages the lip **1013** of tumbler **1012** so as to aid in pushing tumbler **1012** uniformly against the surface of mold **1026**. In **Figure 18**, mold **1026** is shown containing a mold configuration **1028** which is capable of forming a printing lug on the bottom **1018** of base **1016**. Mold **1026** can contain other mold features including indicia or trademark logos and the like. Mold **1026** can be secured to blow mold **1010** via threaded connector **1027**. It has been found that the mechanical pressure of ejection core **1020** against the inside surface of base **1016** provides adequate pressure against the mold **1026** to adequately stamp any indicia or other configuration into the base of the tumbler. Typically, the pressure of the ejection core **1020** against the base **1016** within the blow cavity to mold or stamp the base takes approximately 0.5 second. Mold **1026** can include a cooling channel **1030** to provide the cooling of the base subsequent to the molding operation. Likewise, ejection core **1020** can also be provided with a cooling channel **1032**. In each of cooling channels **1030** and **1032**, cooling fluids such as water can be circulated therein to provide

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the proper temperature. Subsequent to the molding or stamping operation, the ejection core **1020** is removed from the blow cavity. Since the mandrel **1020** contacts the inside sidewall **1014** of tumbler **1012**, the tumbler is removed from the blow cavity as well and transferred to any conveying station as described previously. The ejection core **1020** is an alternative to the ejection core **950** shown in **Figures 11, 12** and **13** and can be attached to a motive means as described above with respect to core **950** to provide a continuous process of injection blow-molding and molding the base of the tumbler.

Cont'd

Annex EE
(clean version of pages 58-59 of specification)

Another improvement relative to U.S. 4,540,543 is shown in **Figure 19**. **Figure 19** is an alternative blow mold cavity configuration which is different than, for example, the blow cores shown in **Figures 14** and **15**. Thus, in the previous description, blowing of the parison into the molded tumbler was achieved by directing fluid through a blow slot in the core which directed the fluid at the base of the parison mold. Subsequently, the fluid pressure would work its way up the mold and be vented from the entrance of the mold. With respect to the tumbler, the initial fluid pressure would be at the base of the tumbler and work its way along the sidewall to the tumbler opening. In accordance with this invention, it has been found that a uniform blow-molded tumbler can be better achieved by directing the fluid pressure during the blow stage from the top of the mold and working down toward the base of the blow cavity or, with respect to the tumbler, blowing the parison at the opening of the tumbler and working down toward the base of the tumbler. Such configuration is shown in **Figure 19** which includes a blow mold **1040** into which has already been inserted the core **1042** which contains the injected molded parison **1044** contained along the outside surface of core **1042**. The blow mold includes a mold surface **1046** in the shape of the bell fountain tumbler. The core **1042** includes a blow vent **1048** which releases a fluid into the mold **1040** near the entrance thereof or with respect to the tumbler, near the opening of the tumbler. The fluid pressure travels down the core **1042** blowing and pressing the parison **1044** against mold surface **1046** from the top of the parison to the base **1050** of the parison. Blow cavity **1040** also includes the base mold **1026** as described in **Figure 18** which allows the molding of the base of the blow-molded tumbler once core **1042** is removed and ejection core **1020** is inserted. Mold **1026** includes a vent **1052** connected to mold **1040** to vent excess fluid pressure. It has been found that a more uniform sidewall can be achieved by blowing from the opening of the parison/tumbler to the base thereof. This method of blowing the parison has previously been done to blow polystyrene disposable containers but is not believed to have been done with resins other than polystyrene and not to form permaware tumblers having sidewall thicknesses of greater than 50 mils.